Name:

at1117paper: Complete the Square (v317)

Example

A square's edge length is x feet. A rectangle has a height of x feet and a width of 56 feet. Their combined area, found by adding the square's area and the rectangle's area, is 2241 square feet. What is the value of x?

Example's Solution

$$x^2 + 56x = 2241$$

To complete the square, add $\left(\frac{56}{2}\right)^2 = 784$ to both sides.

$$x^2 + 56x + 784 = 3025$$

Recognize the left side is now a perfect-square trinomial. Factor the left side.

$$(x + 28)^2 = 3025$$

Undo the squaring.

$$x + 28 = \pm\sqrt{3025}$$

$$x + 28 = \pm 55$$

Subtract 28 from both sides.

$$x = -28 \pm 55$$

In this geometric example, we are only concerned about the positive solution. So,

$$x = 27$$

Question 1

A square's edge length is x feet. A rectangle has a height of x feet and a width of 22 feet. The total area, of the square and rectangle, is 240 square feet. What is the value of x?

$$x^2 + 22x = 240$$

$$x^2 + 22x + 121 = 361$$

$$(x + 11)^2 = 361$$

$$x + 11 = \pm 19$$

$$x = 8$$

Question 2

A square's edge length is x feet. A rectangle has a height of x feet and a width of 60 feet. The total area, of the square and rectangle, is 781 square feet. What is the value of x?

$$x^2 + 60x = 781$$
$$x^2 + 60x + 900 = 1681$$
$$(x + 30)^2 = 1681$$
$$x + 30 = \pm 41$$
$$x = 11$$

Question 3

A square's edge length is x feet. A rectangle has a height of x feet and a width of 18 feet. The total area, of the square and rectangle, is 175 square feet. What is the value of x?

$$x^2 + 18x = 175$$
$$x^2 + 18x + 81 = 256$$
$$(x + 9)^2 = 256$$
$$x + 9 = \pm 16$$
$$x = 7$$